

## 1.4

### Identify Zeros and End Behavior and Graphing

Name \_\_\_\_\_ Period \_\_\_\_\_ Date \_\_\_\_\_

Without using technology, sketch each polynomial. (Hint: Identify the zeros, their multiplicity, determine whether they touch or cross the x-axis at each zero and describe their end behavior)

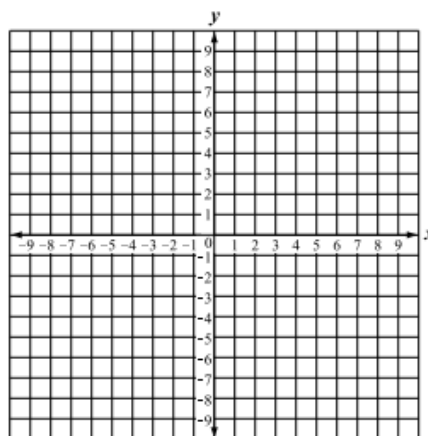
1.  $f(x) = (x + 1)(x - 1)(x - 3)$

$$f(x) = x^3 - 3x^2 - x + 3$$

Zeros	Multiplicity	Touch/Cross

$$\lim_{x \rightarrow -\infty} f(x) =$$

$$\lim_{x \rightarrow \infty} f(x) =$$



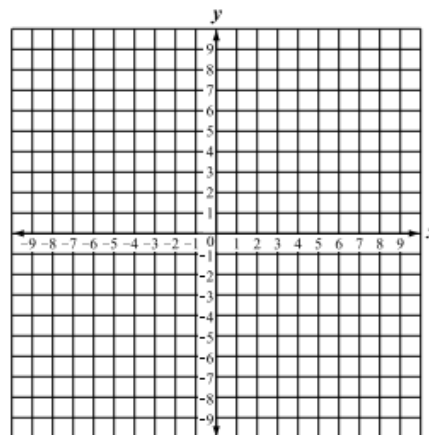
2.  $f(x) = (x + 3)(x)(5x - 4)$

$$f(x) = x^3 - x^2 - 12x$$

Zeros	Multiplicity	Touch/Cross

$$\lim_{x \rightarrow -\infty} f(x) =$$

$$\lim_{x \rightarrow \infty} f(x) =$$

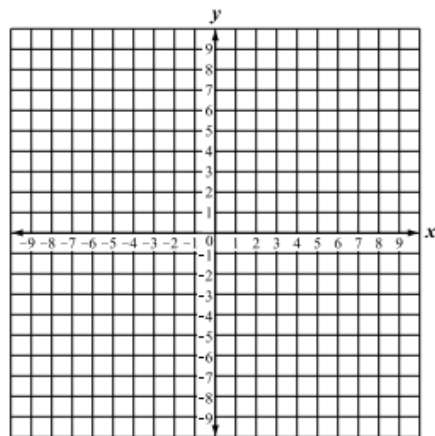


3.  $f(x) = (x + 4)(x + 1)(x - 2)(x - 3)$

$$f(x) = x^4 - 15x^2 + 10x + 24$$

Zeros	Multiplicity	Touch/Cross

$$\lim_{x \rightarrow -\infty} f(x) = \quad \lim_{x \rightarrow \infty} f(x) =$$

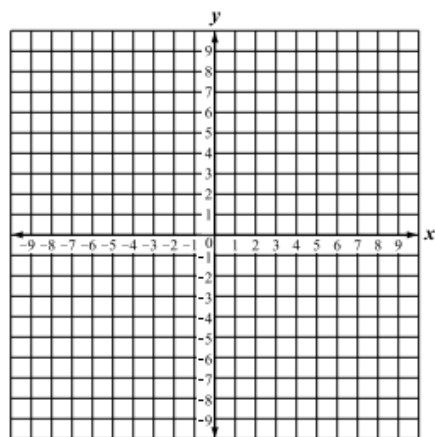


4.  $f(x) = (x + 1)(x - 3)^2$

$$f(x) = x^3 - 5x^2 + 3x + 9$$

Zeros	Multiplicity	Touch/Cross

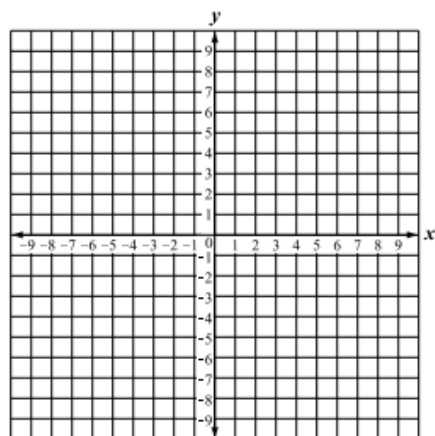
$$\lim_{x \rightarrow -\infty} f(x) = \quad \lim_{x \rightarrow \infty} f(x) =$$



5.  $f(x) = (2x - 5)^3(x + 4)^2$

Zeros	Multiplicity	Touch/Cross

$$\lim_{x \rightarrow -\infty} f(x) = \quad \lim_{x \rightarrow \infty} f(x) =$$

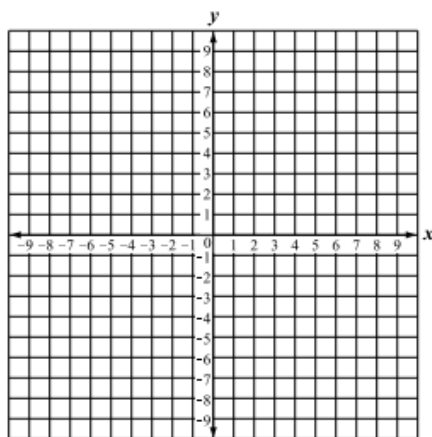


6.  $f(x) = 4(x - 3)^3(x - 4)$

Zeros	Multiplicity	Touch/Cross

$$\lim_{x \rightarrow -\infty} f(x) =$$

$$\lim_{x \rightarrow \infty} f(x) =$$

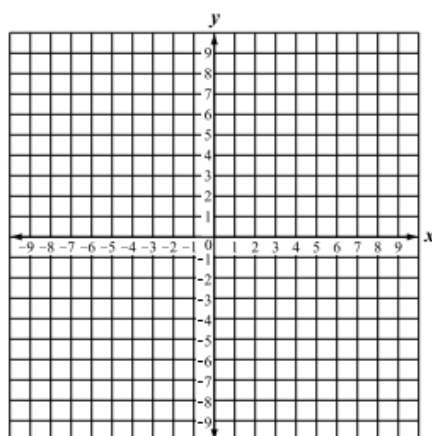


7.  $f(x) = -5(x - 3)^4(3x + 2)^2$

Zeros	Multiplicity	Touch/Cross

$$\lim_{x \rightarrow -\infty} f(x) =$$

$$\lim_{x \rightarrow \infty} f(x) =$$

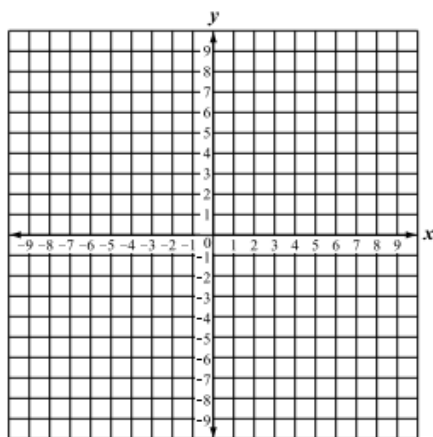


8.  $f(x) = (2x - 3)^2(x + 1)(x - 5)$

Zeros	Multiplicity	Touch/Cross

$$\lim_{x \rightarrow -\infty} f(x) =$$

$$\lim_{x \rightarrow \infty} f(x) =$$

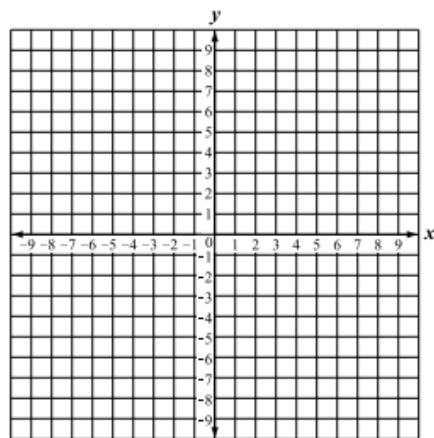


9.  $f(x) = x^2(4x + 3)^2$

Zeros	Multiplicity	Touch/Cross

$$\lim_{x \rightarrow -\infty} f(x) =$$

$$\lim_{x \rightarrow \infty} f(x) =$$

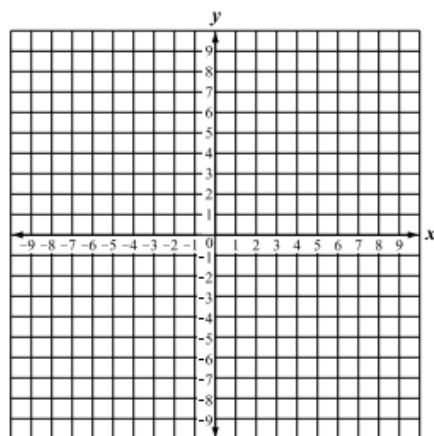


10.  $f(x) = -x^6(x - 1)$

Zeros	Multiplicity	Touch/Cross

$$\lim_{x \rightarrow -\infty} f(x) =$$

$$\lim_{x \rightarrow \infty} f(x) =$$

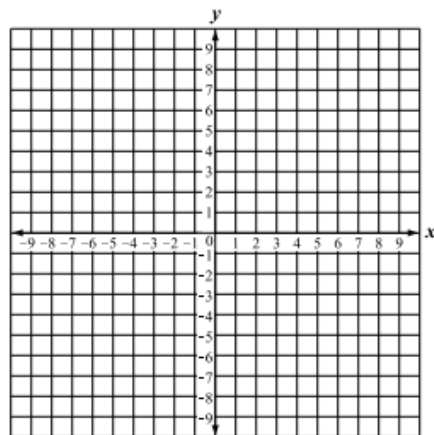


11.  $f(x) = 6x^3(x^2 - 9)(x + 2)$

Zeros	Multiplicity	Touch/Cross

$$\lim_{x \rightarrow -\infty} f(x) =$$

$$\lim_{x \rightarrow \infty} f(x) =$$

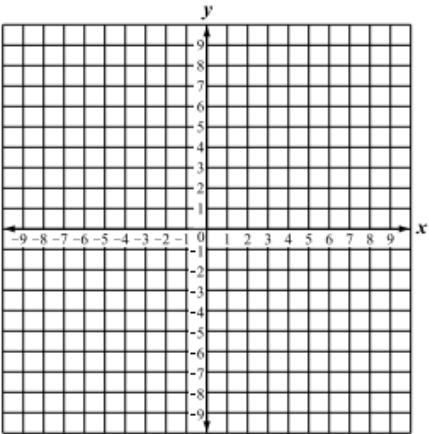


12.  $f(x) = x^2 + 7x + 12$

Zeros	Multiplicity	Touch/Cross

$\lim_{x \rightarrow -\infty} f(x) =$

$\lim_{x \rightarrow \infty} f(x) =$

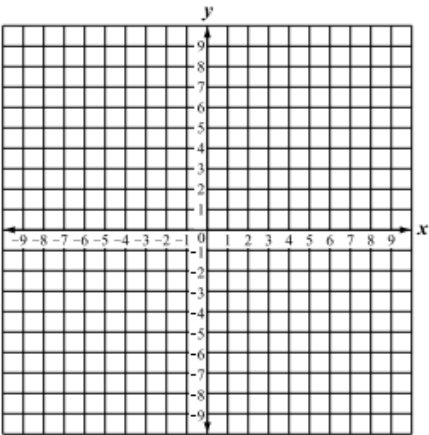


13.  $f(x) = x^2 + 2x$

Zeros	Multiplicity	Touch/Cross

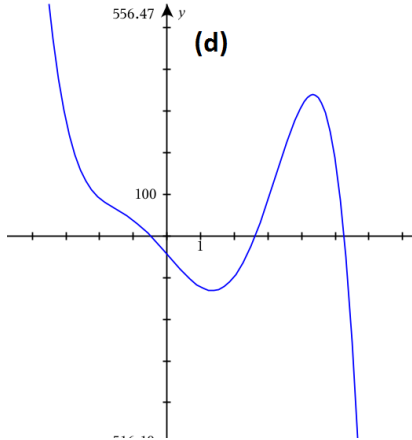
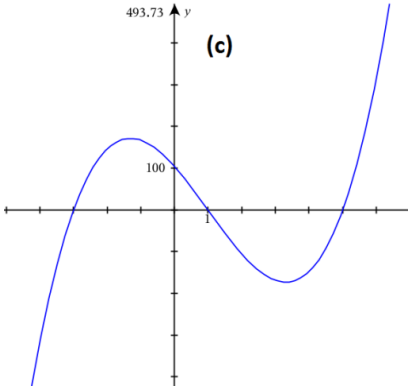
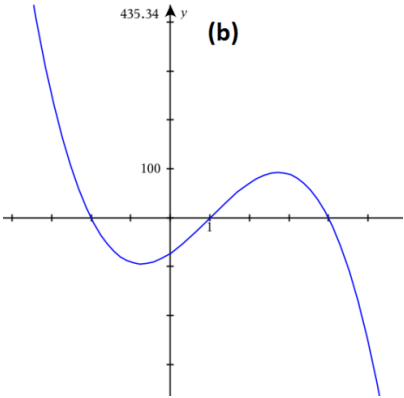
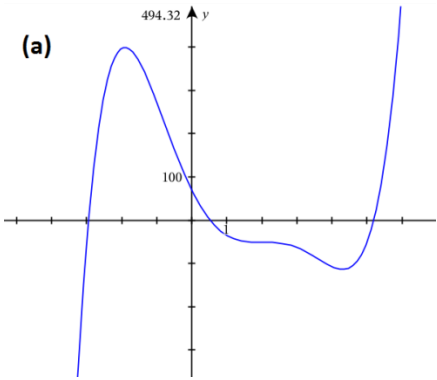
$\lim_{x \rightarrow -\infty} f(x) =$

$\lim_{x \rightarrow \infty} f(x) =$



Match the polynomial function with its graph (without a graphing calculator!). Explain your choice.

14.  $f(x)=7x^3-21x^2-91x+104$
15.  $f(x)=-9x^3+27x^2+54x-73$
16.  $f(x)=x^5-8x^4+9x^3+58x^2-164x+69$
17.  $f(x)=-x^5+3x^4+16x^3-2x^2-95x-44$



**Use technology** to graph the polynomial. Identify the zeros, their multiplicity, determine whether they touch or cross the x-axis at each zero and determine the end behaviors.

18.  $f(x) = (x + 1)^3(x - 1)^2(x - 3)$

$\lim_{x \rightarrow -\infty} f(x) =$ 
 $\lim_{x \rightarrow \infty} f(x) =$

Zeros	Multiplicity	Touch/Cross

19.  $f(x) = x^3 + x^2 + 4x + 4$

$\lim_{x \rightarrow -\infty} f(x) =$ 
 $\lim_{x \rightarrow \infty} f(x) =$

Zeros	Multiplicity	Touch/Cross